FLEXICOKING Process Description

Reactor

Oil is cracked in Reactor and does not travel to Hx or Gx

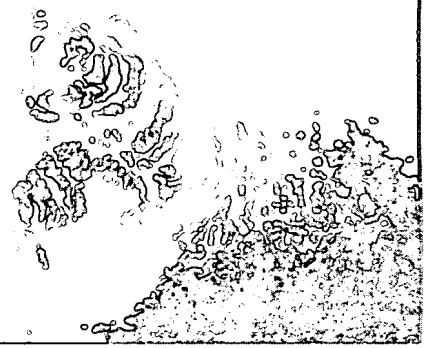
- 600 ton fluidized bed of 50 - 300 micron coke particles at 510 - 530°C
  - 7 meters diameter, 70 meters high
  - fluidization by steam and product vapors
- Reactor is fed at 6 elevations; several feed nozzles per ring
- Product yields

– Gas and LPG	10 - 15 %
– Naphtha and gasoils	55 - 65 %
– Coke	25 - 30 %

FLEXICOKING Process Description

Reactor

- Heat input via coke transport from heater, 2000 ton/hr, dT= 100 °C
- Tight temperature control
  - reactor too hot : liquid yield loss due to over cracking
  - reactor too cold : more wall coke or even bogging
- Reactor products leave reactor via cyclones to scrubber
  - entrained coke particles are scrubbed with liquid feed in scrubber
  - preheat feed and control FBP heavy gasoil product / recycle

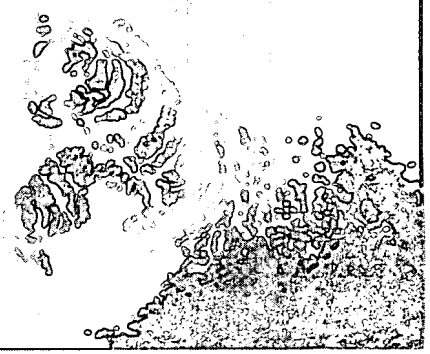


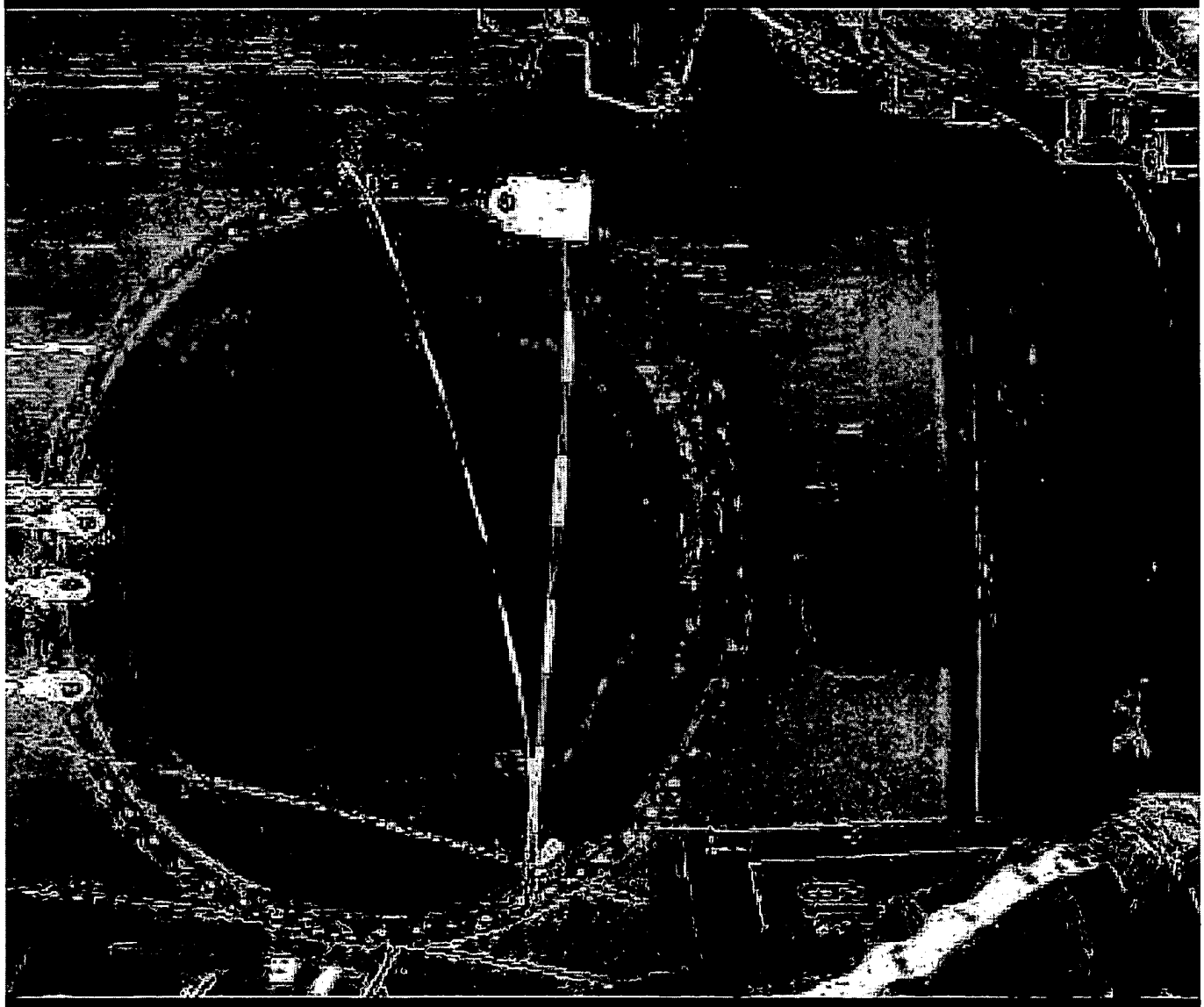
FLEXICOKING Process Description

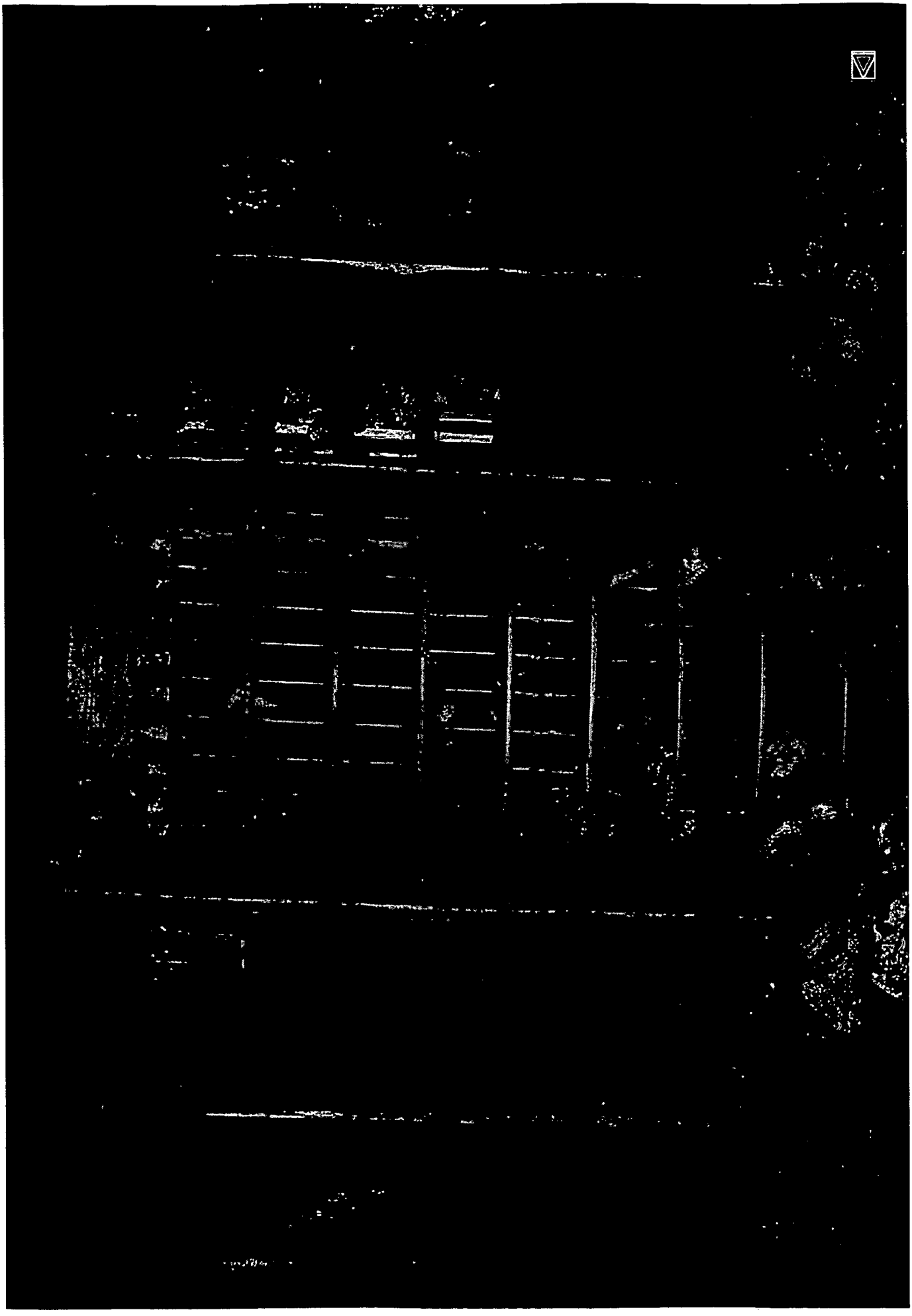
Reactor

What to watch for during operation ?

- Bogging (too low Reactor temperature)
- Blockage of coke transport to/from heater
- Coke entrainment / sticky coke
- High vessel wall temperature
- Hydrocarbon carry under



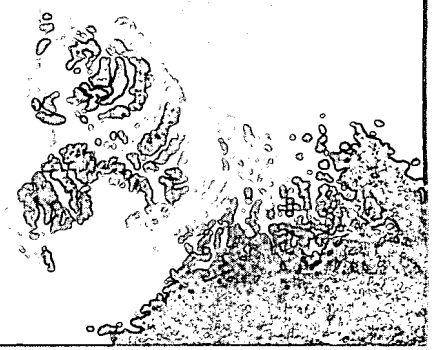




FLEXICOKING Process Description

Heater

- 600 - 630°C bed, fluidized by LJG from Gasifier
- Cools LJG and transfers heat to cold reactor coke
- Temperature fine tuning with a little bit of air
- Mechanically complicated vessel
  - many transfer lines and 14 two stage cyclones
  - internal gas distribution/bed support grid exposed to high temperatures
  - "quench tee" and "sugar scoop"

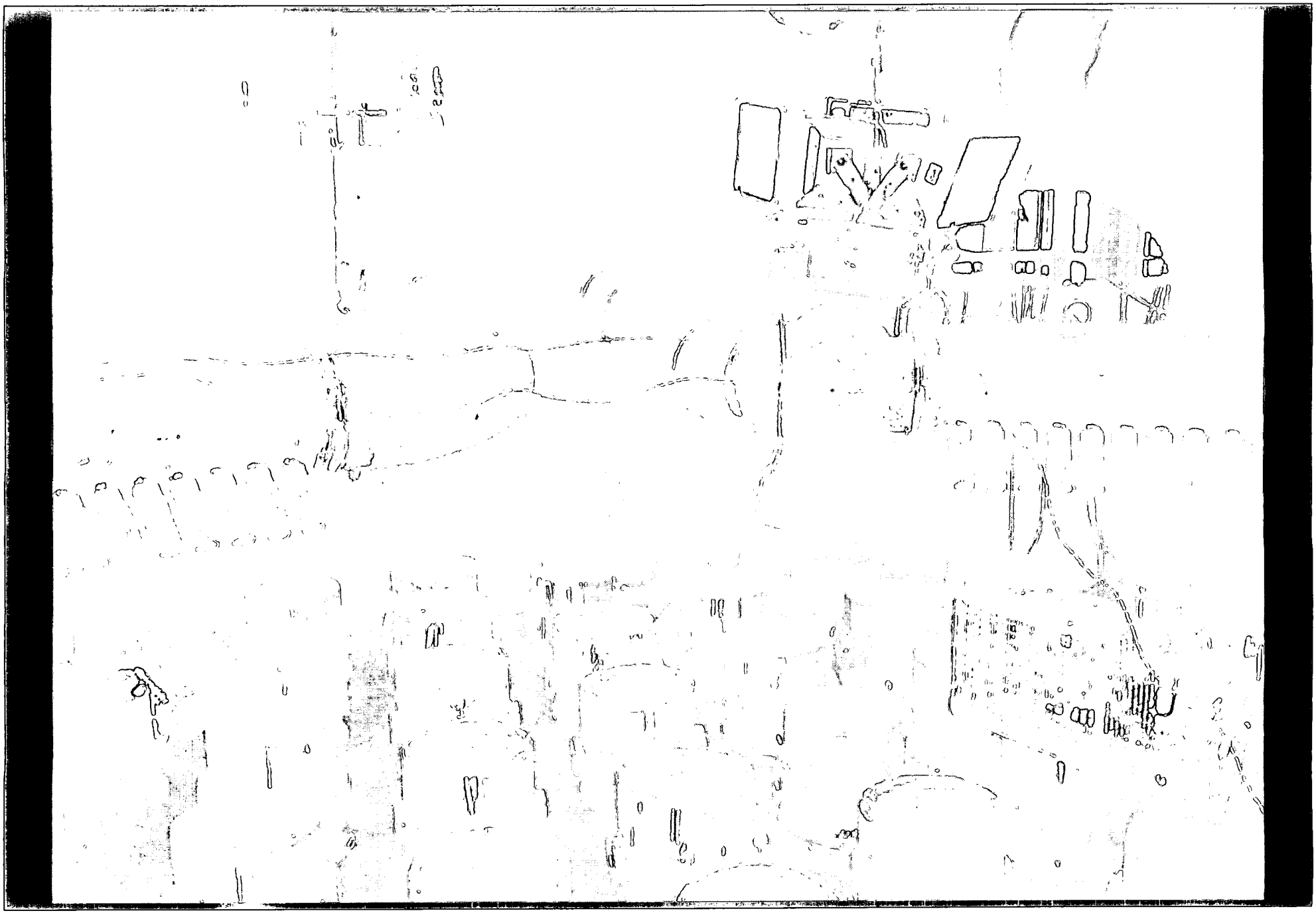


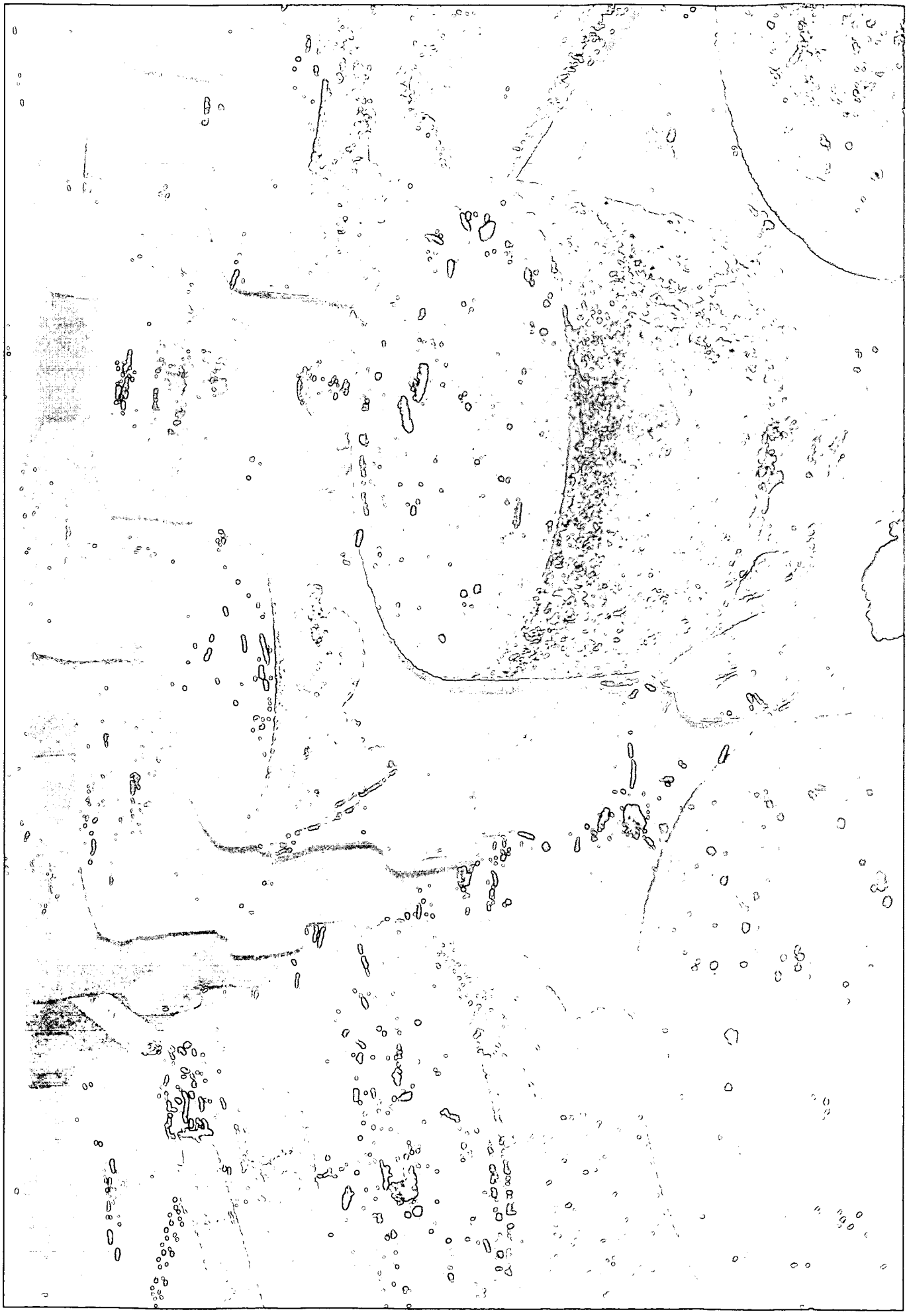
FLEXICOKING Process Description

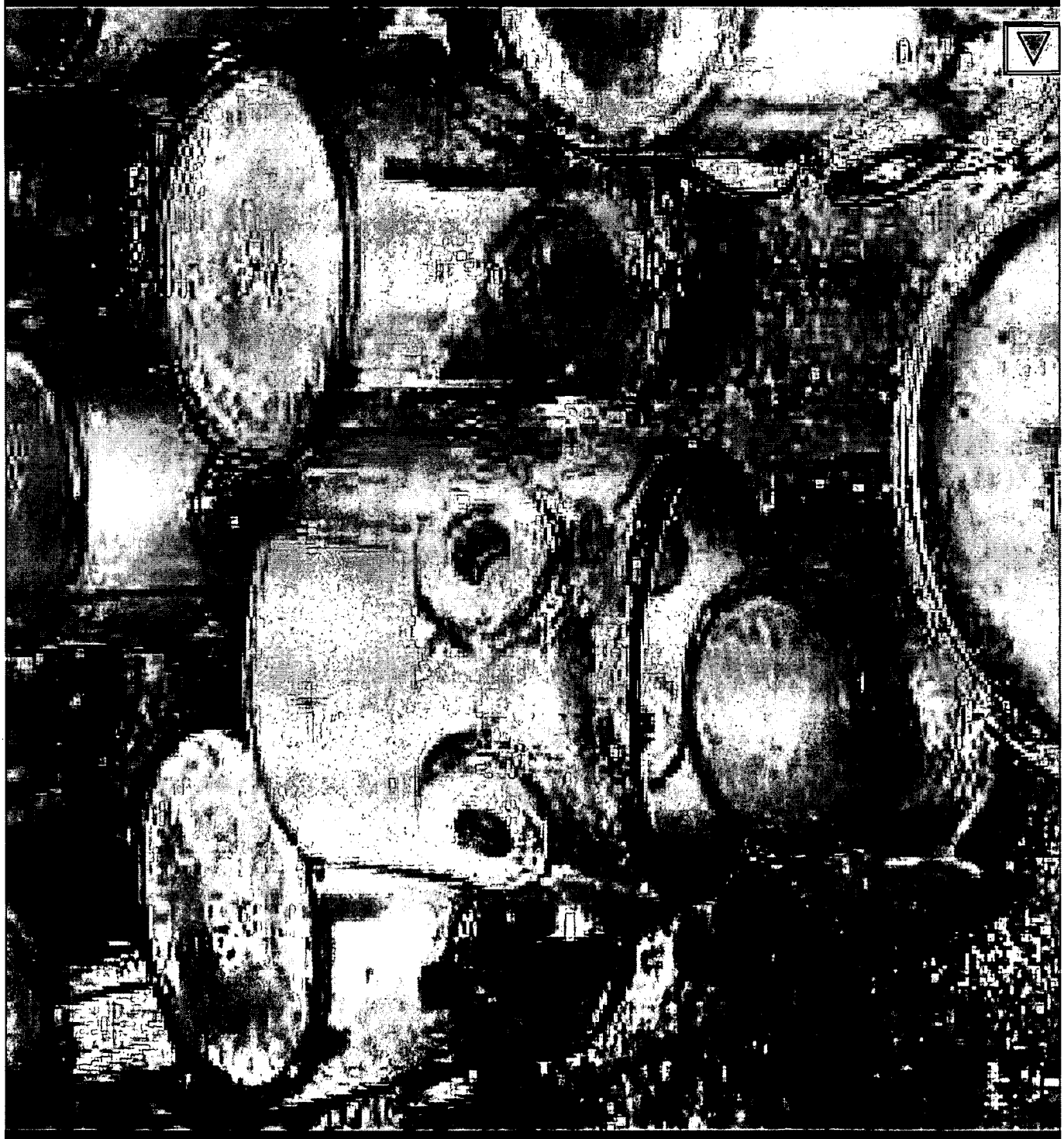
Heater Maintenance Challenges

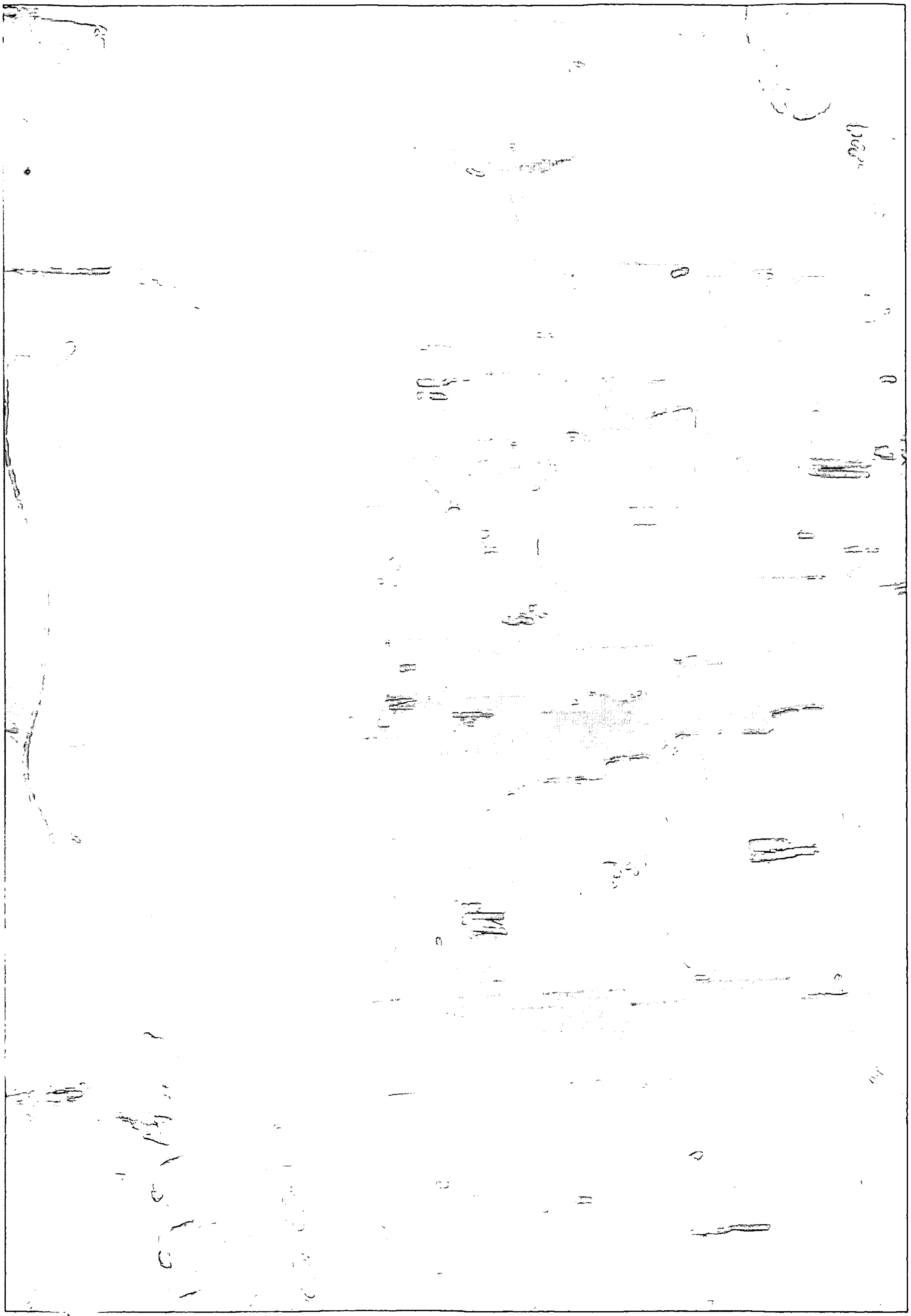
Grid Can Orifice Erosion

- Orifices center caps plug with coke lumps
- Orifices of outer caps erode in 1 run
- Replace entire can is quickest repair option
- Repairs on critical path of site turnaround
- Splash plates and birdcages
- Grid redesign idea









FLEXICOKING Process Description

Heater Maintenance Challenges

Carburization of Stainless Steel

- All internals stainless steel : 18% Cr/ 8% Ni
- Temperature range 590 - 635°C
- Gas contains H_2, CO and H_2S
- CO reacts with Cr to chromium carbides
- H_2S corrosion of steel due to reduced Cr content
- Cyclones replaced in last turnaround